

THURSDAY, NOVEMBER 28, 1918.

ABSORPTION SPECTRA AND CHEMICAL CONSTITUTION.

Colour in Relation to Chemical Constitution. By Prof. E. R. Watson. Pp. xii+197. (London: Longmans, Green, and Co., 1918.) Price 12s. 6d. net.

IT is justifiable to ask whether this book has been written to help those engaged in research on synthetic dyestuffs or as a text-book for those investigating the problems of absorption spectra. On one hand it contains scarcely anything of sufficient definiteness for the colour chemist to pin his faith to, and, on the other, the information is not complete enough to justify its use as a text-book on absorption spectra. The author, however, can scarcely be blamed for the lack of definiteness in establishing even one article of faith for the colour chemist to accept, because it is progressively becoming more evident that there is no definite relation between colour and chemical constitution in the generally accepted sense. Every one of the theories connecting the two that from time to time have been proposed is shown by the author to fail in one way or another. Even his own theory of oscillation within a conjugated system of double bonds is of limited application, for it entirely fails to explain his own test case of the blue nitroso-derivatives of the paraffins, not to mention the numerous examples of colour changes shown by the same compound in different solvents. The time has surely come when it were wiser frankly to let the colour chemist into the secret and tell him that the usual conception of correlation between colour and constitution has been found to be unsound. Let us be brave and state that the real connection between them is far deeper than any of the theories of Witt, Nietzki, Armstrong, von Baeyer, or Hantzsch would lead us to believe.

Criticism must be made of some statements in this book, statements which cannot be allowed to pass unchallenged. For example, Beer's law cannot be said to be true within a wide range. The substances which conform to this law are relatively few, and, indeed, the law is more honoured in the breach than in the observance. Then, again, it would seem that the author has confused the number of absorption bands shown by substances. Many absorption bands exhibit a number of sub-groups, and great care must be taken to guard against looking upon these sub-groups as separate absorption bands. Some of the author's criticisms are based on this error and lose their point when it is remembered that different sub-groups of one band and not different absorption bands are under discussion.

Then, again, the persistence of a band is wrongly defined as the ordinate passing through the head of an absorption band; this ordinate is, of course, a measure of the absorptive power, while the persistence is the difference between the extreme ordinates over which the band persists.

Although this is a minor point, it directs attention to the fact mentioned by the author of the remarkable differences shown by substances in the persistence of their absorption bands. The reason for this is that in the case of those compounds which exhibit relatively shallow bands very few molecules exist in the absorbing condition, the remainder not exerting any selective absorption in the spectral region under examination. It will at once be seen how dangerous it becomes to dogmatise or even postulate any theory as to the constitutional origin of a band when such is due to a very small fraction of the molecules present.

The book is well put together and excellently illustrated with absorption curves of a variety of compounds. The chapters dealing with the earlier theories on colour and constitution are well written, and although the discussion of each of these is necessarily restricted, the author has succeeded in presenting their salient points well. Chapters are devoted to infra-red absorption and to fluorescence, and finally there is a good account of the work on the colour of inorganic compounds. In some ways this book may be recommended, but the impression will remain that the author loses conviction by reason of having stepped too delicately.

E. C. C. B.

SYNTHETIC AND ANALYTIC PHYSICS.

- (1) *Cours de Physique Générale.* By H. Ollivier. Tome Troisième. Pp. 632. (Paris: A. Hermann et Fils, 1918.) Price 30 francs.
- (2) *Electrical Experiments.* By A. Risdon Palmer. Pp. xii+115. (London: Thomas Murby and Co., 1918.) Price 1s. 6d. net.
- (3) *Magnetic Measurements and Experiments (with Answers).* By A. Risdon Palmer. Pp. 124. (London: Thomas Murby and Co., 1918.) Price 1s. 6d. net.

IN the discussion on the teaching of physics in schools which took place recently at a meeting of the Physical Society two methods of teaching physics were contrasted. The first, which may be called the synthetic method, starts from certain general principles and develops the consequences of those principles. The second, or analytic method, dissects out the principles from some more or less complicated piece of mechanism. Thus the first method starts with Boyle's law and ends with the steam-engine, whilst in the second method the order is reversed. Each method has its advantages and its drawbacks, and makes its appeal to a particular type of mind or at a particular stage of development. The volumes under discussion may be regarded as examples of the two methods of presentation.

(1) The subject of vibrations and their transmission forms the groundwork of the third part of M. Ollivier's text-book, and it is developed from first principles with the lucidity which seems to be innate in French scientific writers. The first six chapters may be regarded as introductory; they contain a concise and interesting summary of the main features of periodic functions, of

vibratory movements, and of wave motion. Chap. vii. deals briefly with the subject of acoustics, and includes a detailed description of the anatomy of the ear, with excellent diagrams after A. Pizon. Then follows a lengthy section devoted to physical optics, in which the subjects of interference, diffraction, and polarisation are discussed in a masterly manner, one of the valuable features of this portion of the work being the number of problems worked out in detail with numerical illustrations. In dealing with the passage of polarised light through crystalline plates extensive use is made of the geometrical construction devised by Poincaré, in which the characteristics of the elliptically polarised light are represented by the position of a point on the surface of a sphere.

The damped oscillations of certain material systems, such as moving-coil galvanometers, are considered in chap. xv. At first sight the chapter on thermionic apparatus seems somewhat out of place, but this impression is removed when it is realised how important a part thermionic valves and amplifiers play in connection with electric oscillations and wireless telegraphy and telephony. Recent improvements in these departments of applied electricity are described in most interesting fashion. The remaining chapters deal with electro-optics and optical effects due to motion, the volume closing with a brief review of the principle of relativity.

Special interest attaches to this volume through the circumstances in which it has been produced. In an introductory statement M. Ollivier says: "Ce n'est pas sans une profonde émotion que nous publions ces leçons professées à Lille avant la guerre. Car aux souvenirs heureux qu'elles évoquent pour nous, au rappel d'un temps où notre Université était grande et florissante, s'ajoute en un contraste déchirant la longue et cruelle vision des malheurs qui sont venus. Ce n'est pas à nous qu'il appartient de décrire les souffrances infinies de la ville martyrisée. Mais nous ne voulons pas signer ce livre sans adresser un hommage à nos collègues et à nos élèves morts."

(2 and 3) Two useful books for beginners are provided by Mr. Risdon Palmer, who is familiar with the difficulties of both student and teacher. In the study of electricity the analytic method is employed. The first experiments to be performed involve the use of accumulators, glow-lamps, adjustable resistances, voltmeters and ammeters. Even if the treatment is not strictly logical, the student at once acquires some familiarity with the notions of electromotive force, resistance, and current. In magnetism the idea of pole strength is based on the use of a simple form of magnetic balance, and the experiments are supplemented by illustrative examples and arithmetical questions. Considerable emphasis is rightly laid on the expression of results in the appropriate units, the realisation of the magnitude of the quantities involved, and graphical representations.

H. S. ALLEN.

PRACTICAL FORESTRY.

Forestry Work. By W. H. Whellens. Pp. 236. (London: T. Fisher Unwin, Ltd., 1918.) Price 8s. 6d. net.

THE author of this book is a working forester, who has had much experience while in charge of large wooded estates in England and Scotland. He tries to explain in simple language the actual operations which are usually carried out on such estates, and in this is fairly successful. The book can be recommended as a useful one for the forestry apprentice, and will be found serviceable in giving instruction to disbanded soldiers and to women who are now taking short courses in nursery work, measuring timber, etc., at various centres. There is nothing novel in the book, which is simply a straightforward account of ordinary British forestry practice. Whether this practice requires amendment or improvement is another matter. Hitherto, on private woodland estates, methods have been in vogue which are not strictly economical. In the future money will be scarce, and efforts must be made either to invent cheaper methods or to import such from foreign countries, like the United States, where of late ingenious inventions have been devised, which save labour materially in the planting and in the felling of trees.

Mr. Whellens's first chapter deals mainly with nursery work, and contains much that is valuable and well put; but no mention is made of the transplanting lath or of the method employed at Brocklesby and Abbeyleix, by which young trees are ploughed out of the nursery lines instead of being lifted; yet these are excellent labour-saving devices. The chapter on the preparation of the ground for planting, on draining, and on fencing is well done. Sowing and planting are next dealt with. The chapter on tending plantations is unsatisfactory, the difficult subject of thinning being too briefly treated, while much space is given to pruning, an unnecessary and expensive operation in most cases. Felling timber is rather summarily disposed of, and nothing is said about clearing the area after felling. The space devoted to the measurement of timber is quite inadequate, and requires considerable enlargement to make the subject intelligible to workmen. The chapter on insect and fungoid enemies is without illustrations, and the descriptions are too short. The appendix is a collection of useful tables.

DEVELOPMENTS OF THE THEORY OF RELATIVITY.

The Theory of the Relativity of Motion. By R. C. Tolman. Pp. ix+225. (Berkeley: University of California Press, 1917.)

THE author of this book takes much for granted. The main source of interest in the principle of relativity is the revolution which it demands in the concepts of space and time. It is not easy for most people to accommodate themselves to the changes which they are asked to make in these fundamental elements of their